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**Guimond et al.**

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(54) **OPTIMIZED STUMP HARVESTER**

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(2013.01)

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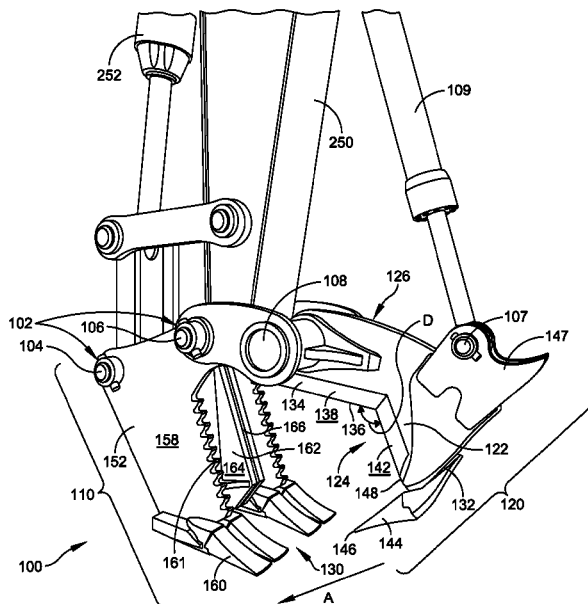
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(57) **ABSTRACT**  
There is disclosed a system and methods of use for quickly  
and efficiently excavating, cross-cutting, splitting, and load-  
ing or stockpiling tree stumpage and other tree or organic  
materials, as well as for performing ground cleanup opera-  
tions. One embodiment provides a stump harvester for  
attachment to a distal end of an excavator arm. The stump  
harvester may include front and back jaw assemblies con-  
figured to pivot between open and closed positions. The  
back jaw assembly may include a knife arm having a cutting  
blade that extends along a majority of a front side of the  
knife arm. A centerline plane may bisect a cutting edge of the  
blade. The front jaw assembly may include a planar-aligned  
dual anvil configured to sheath the cutting edge of the blade  
when the front and the back jaw assemblies move into the  
closed position. Other embodiments are disclosed.

**4 Claims, 12 Drawing Sheets**



**Related U.S. Application Data**

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(51) **Int. Cl.**  
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*E02F 3/96* (2006.01)

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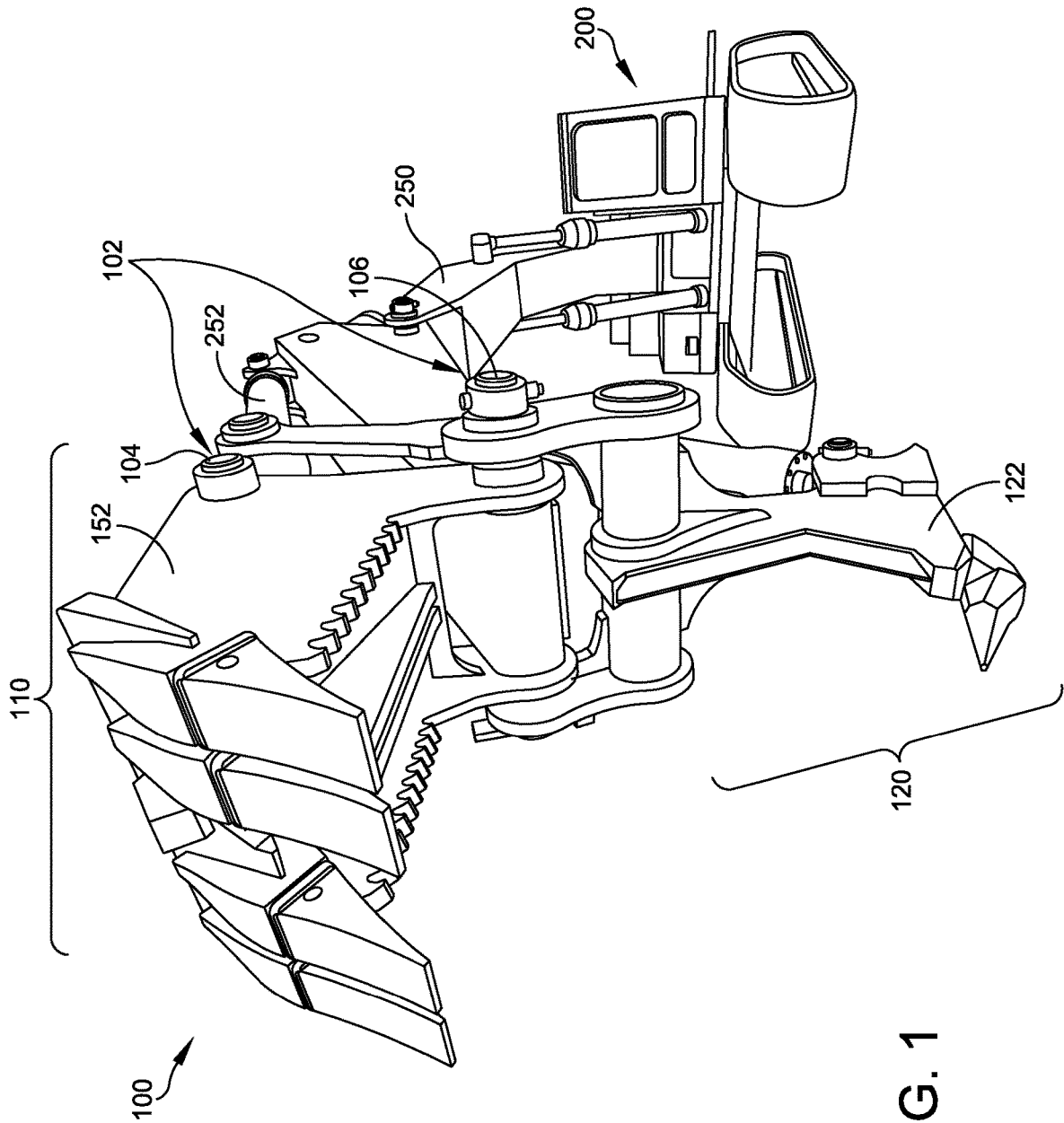


FIG. 1

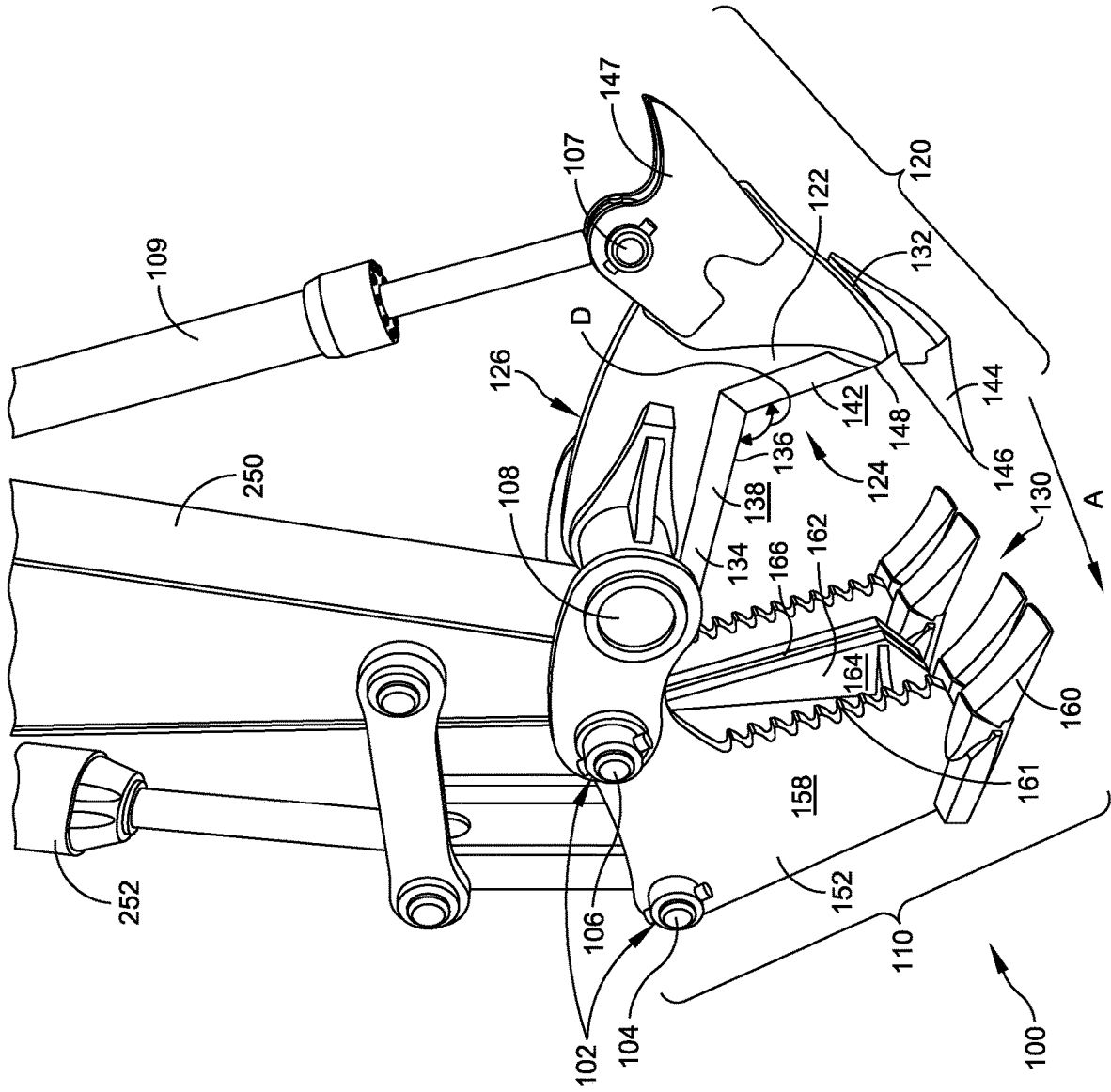


FIG. 2

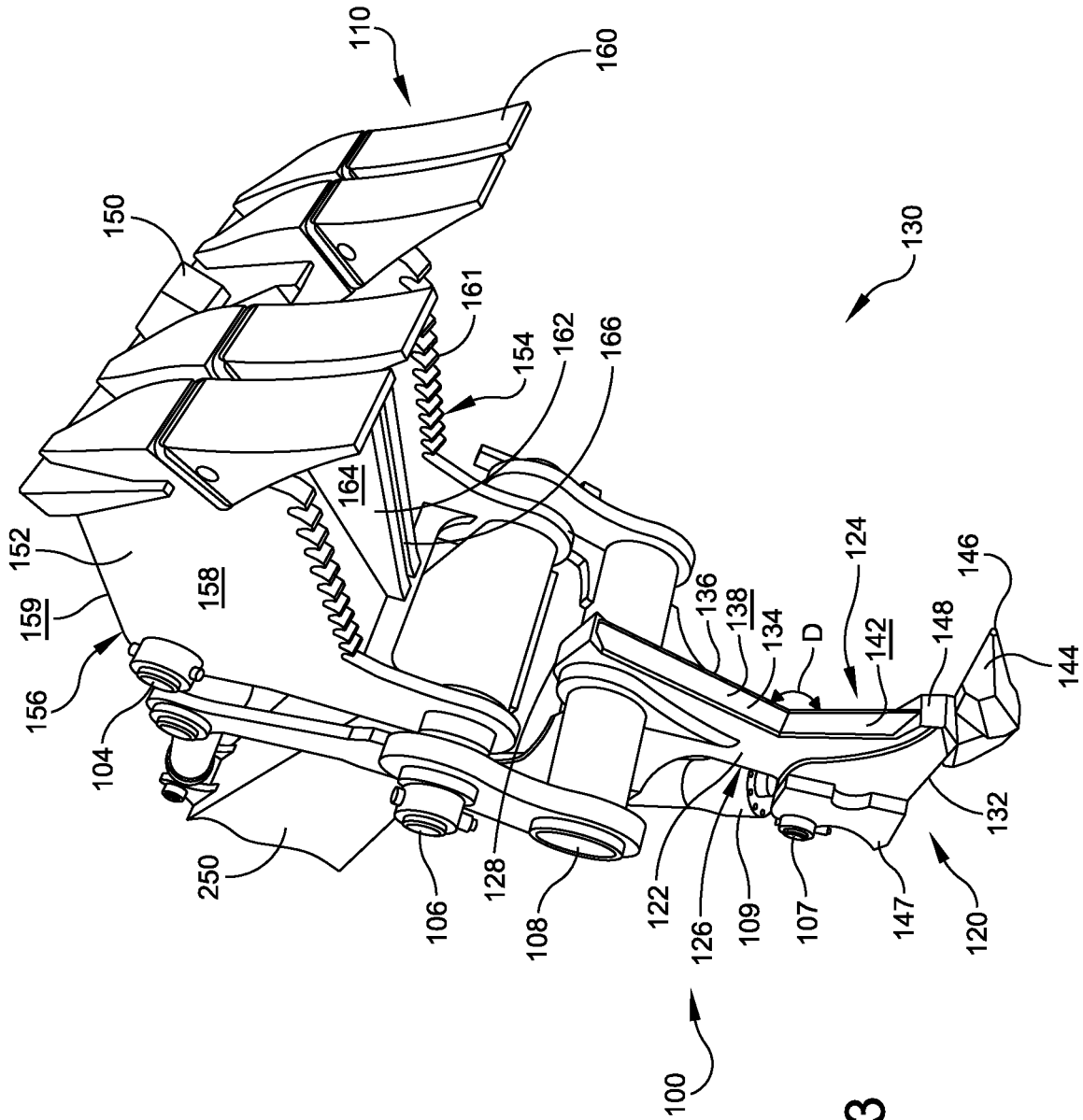


FIG. 3

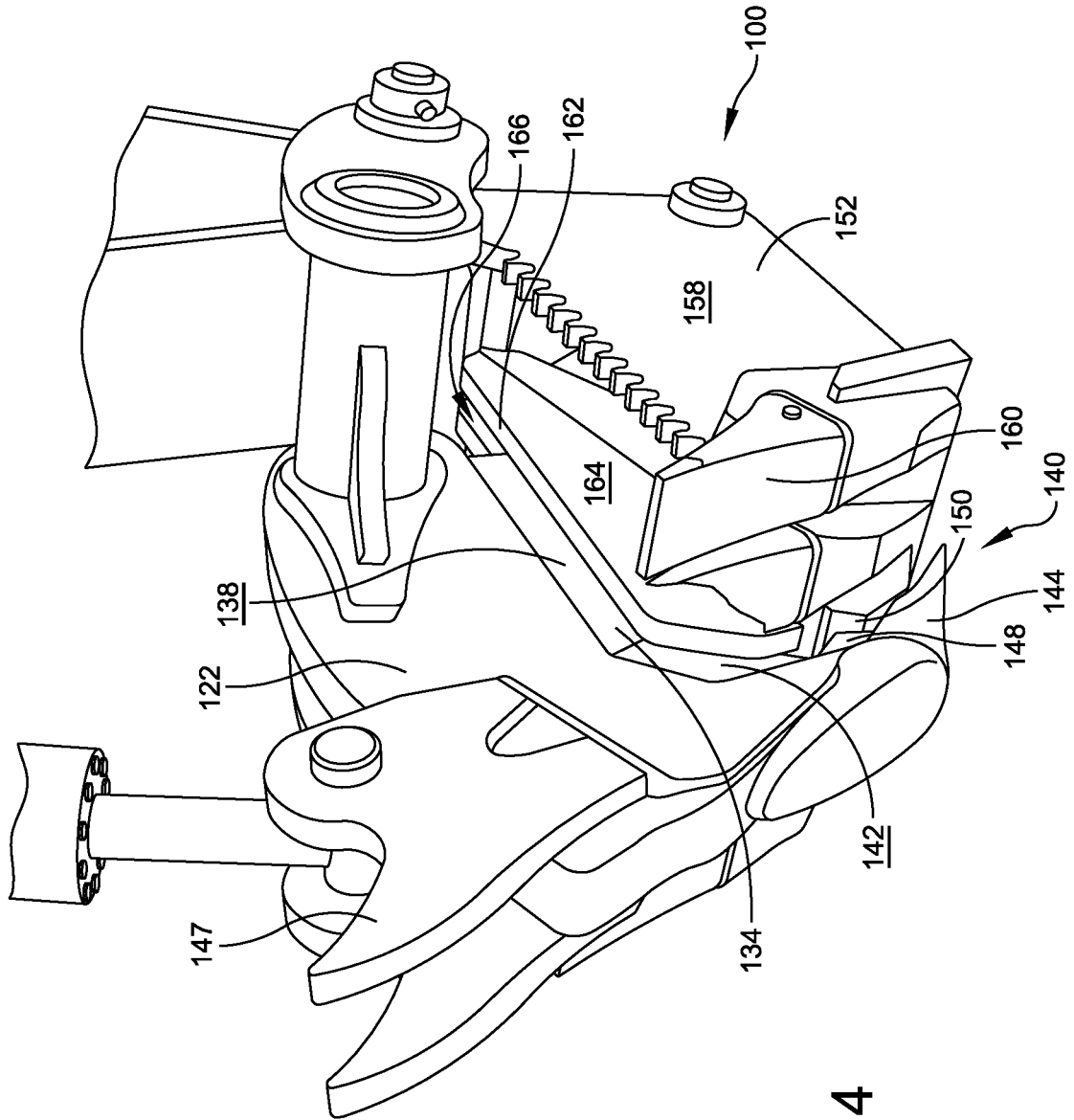


FIG. 4

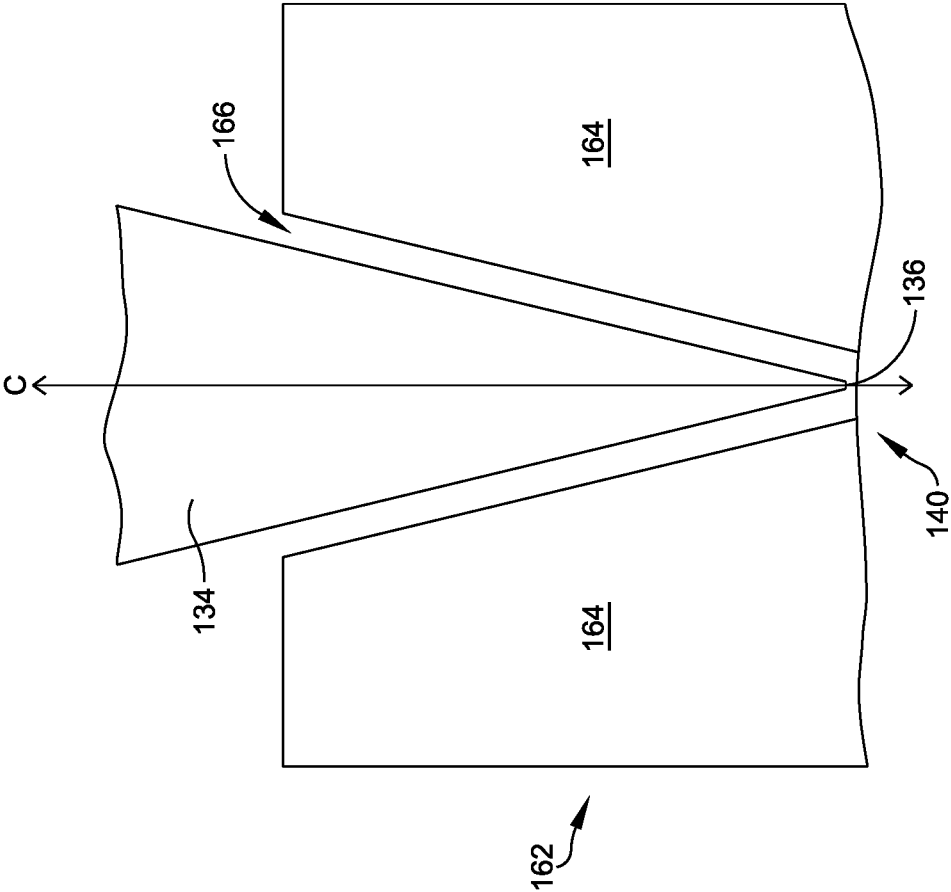


FIG. 5

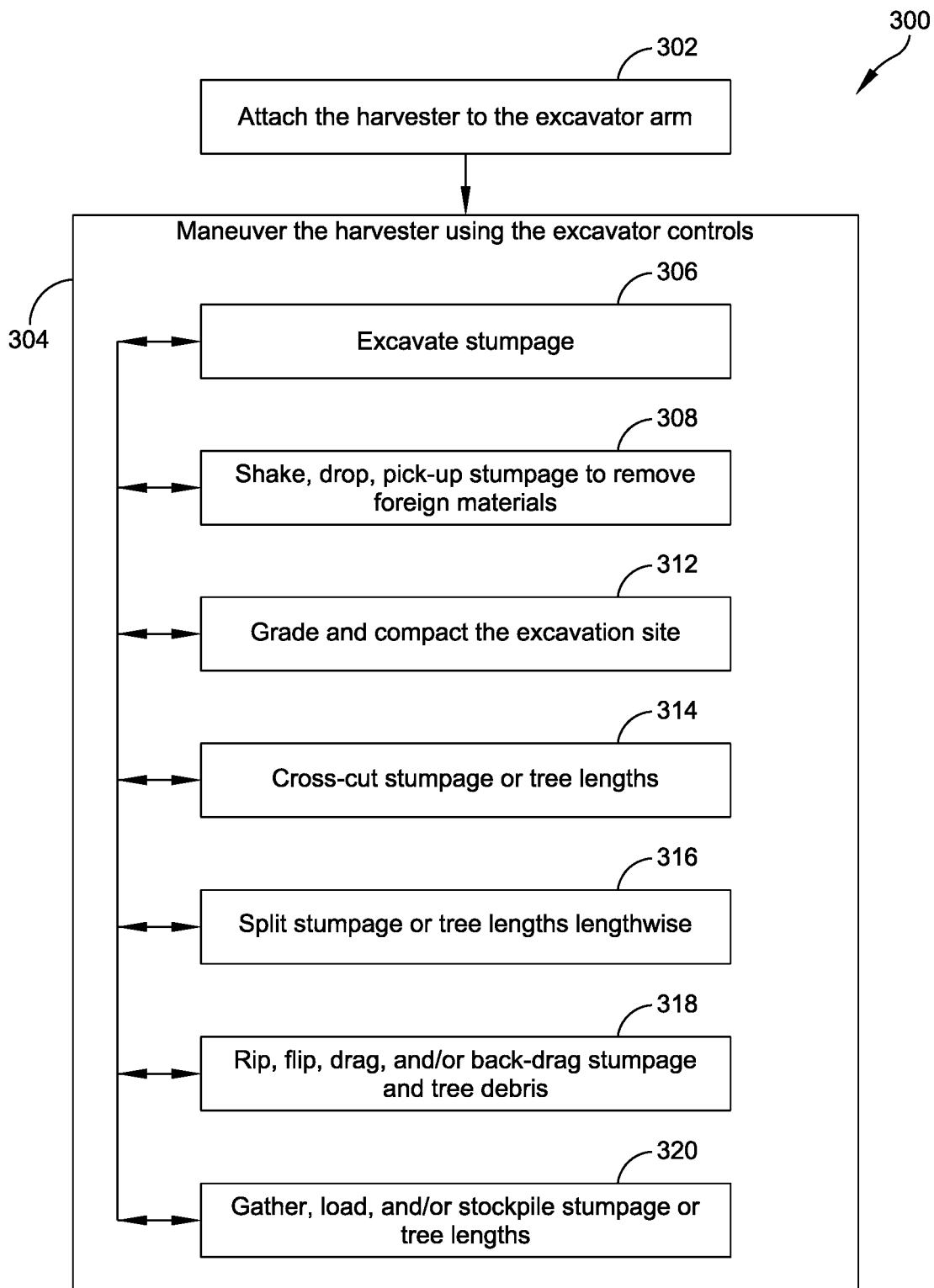


FIG. 6



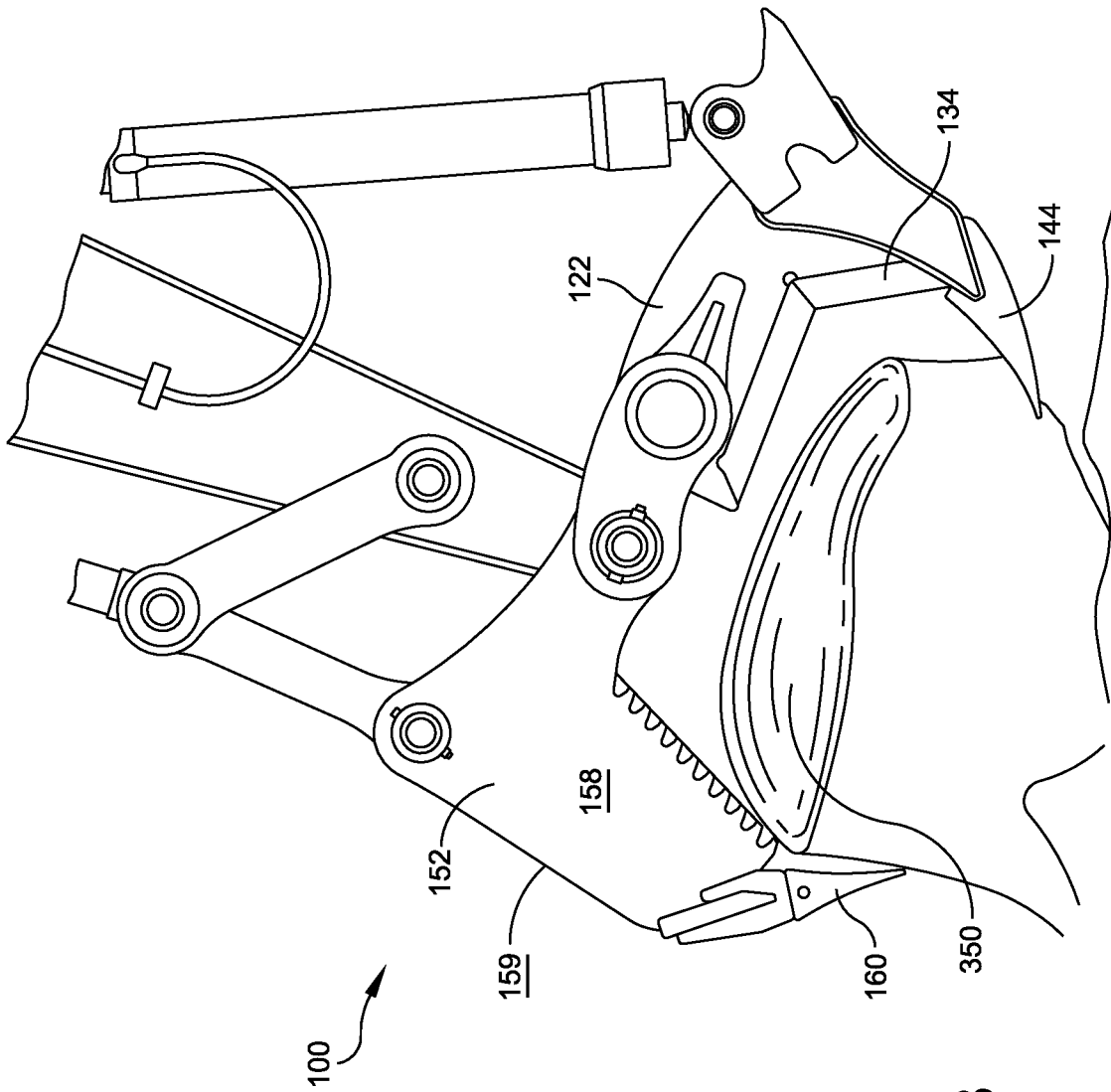


FIG. 7B

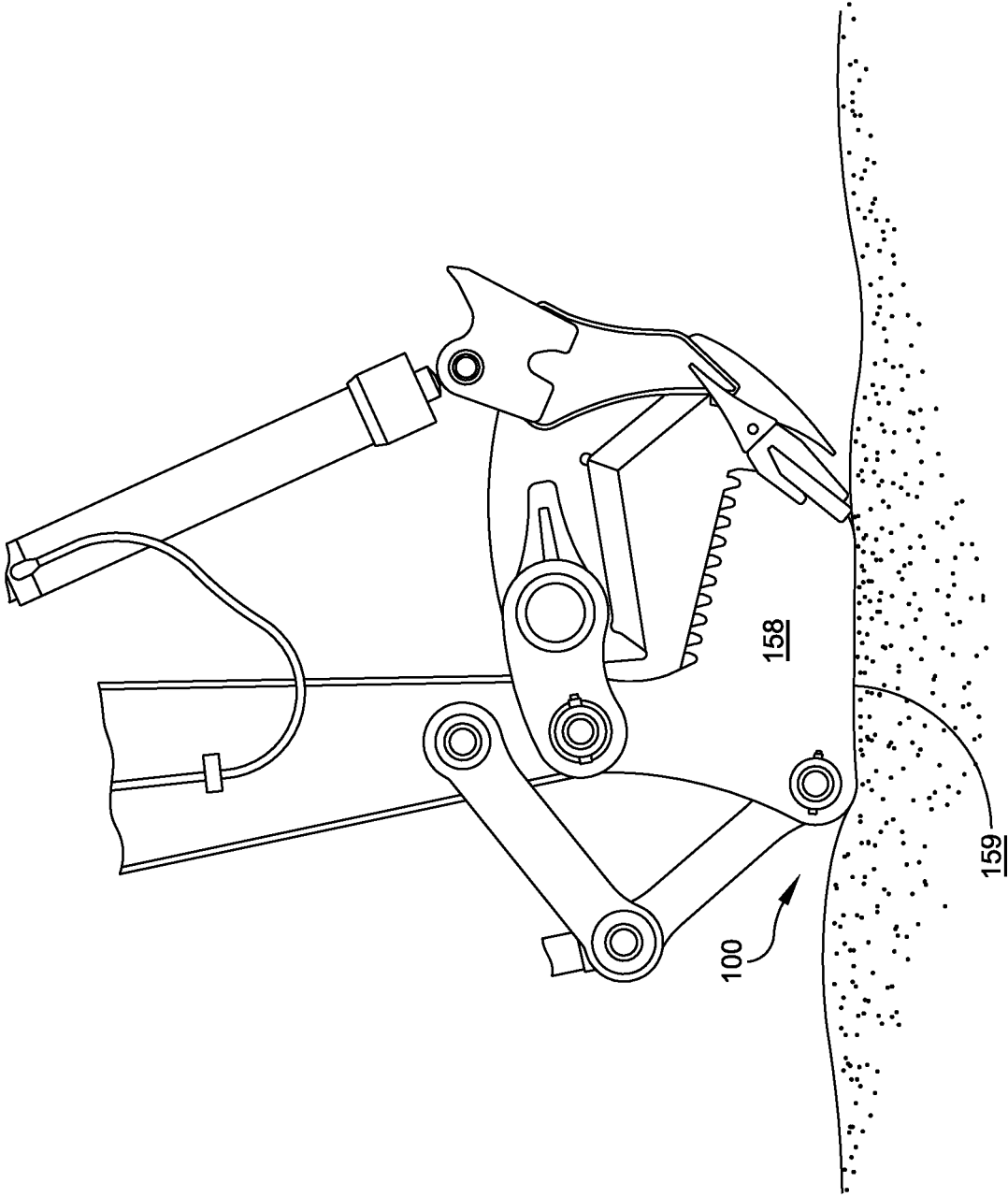


FIG. 8

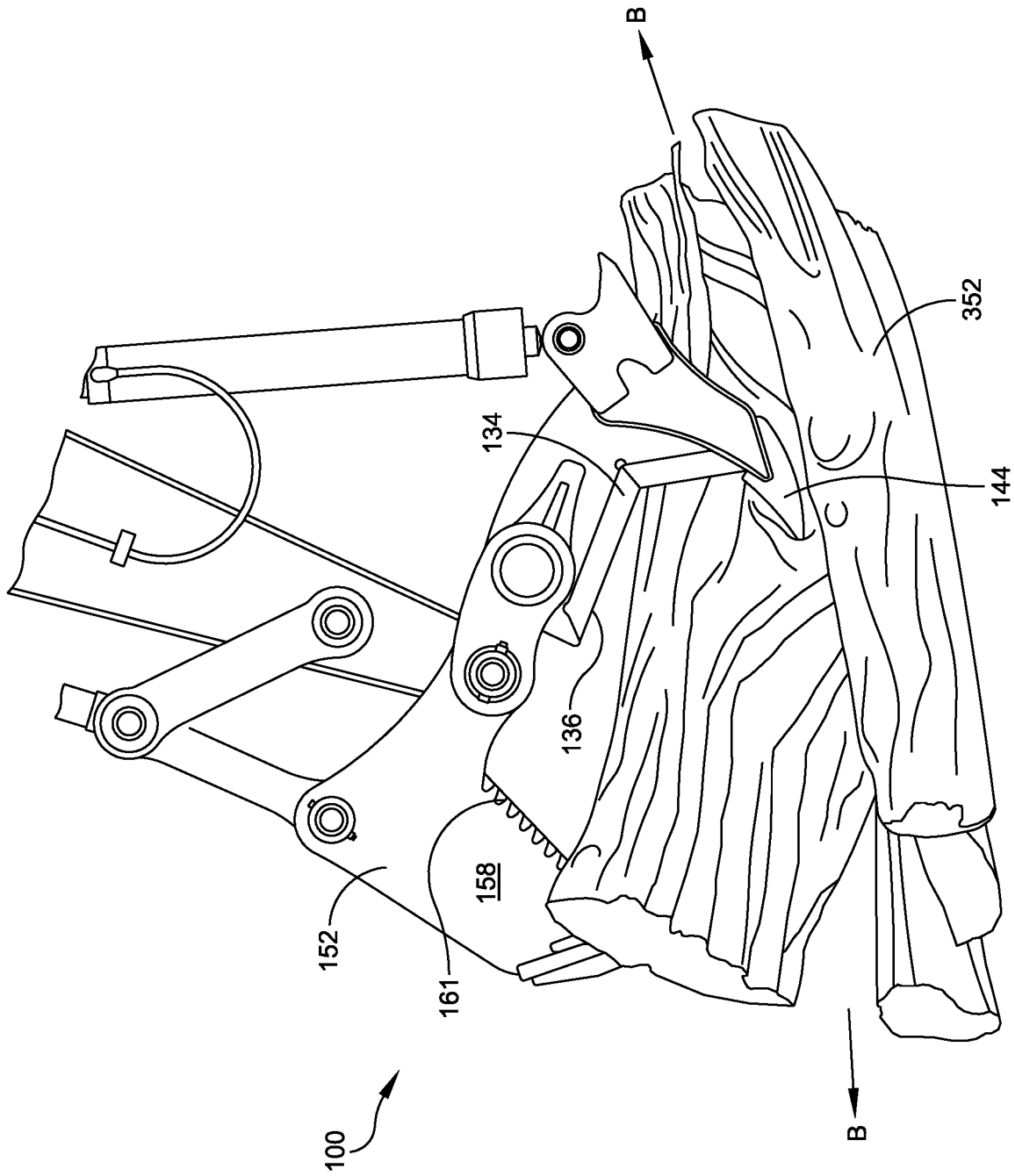


FIG. 9

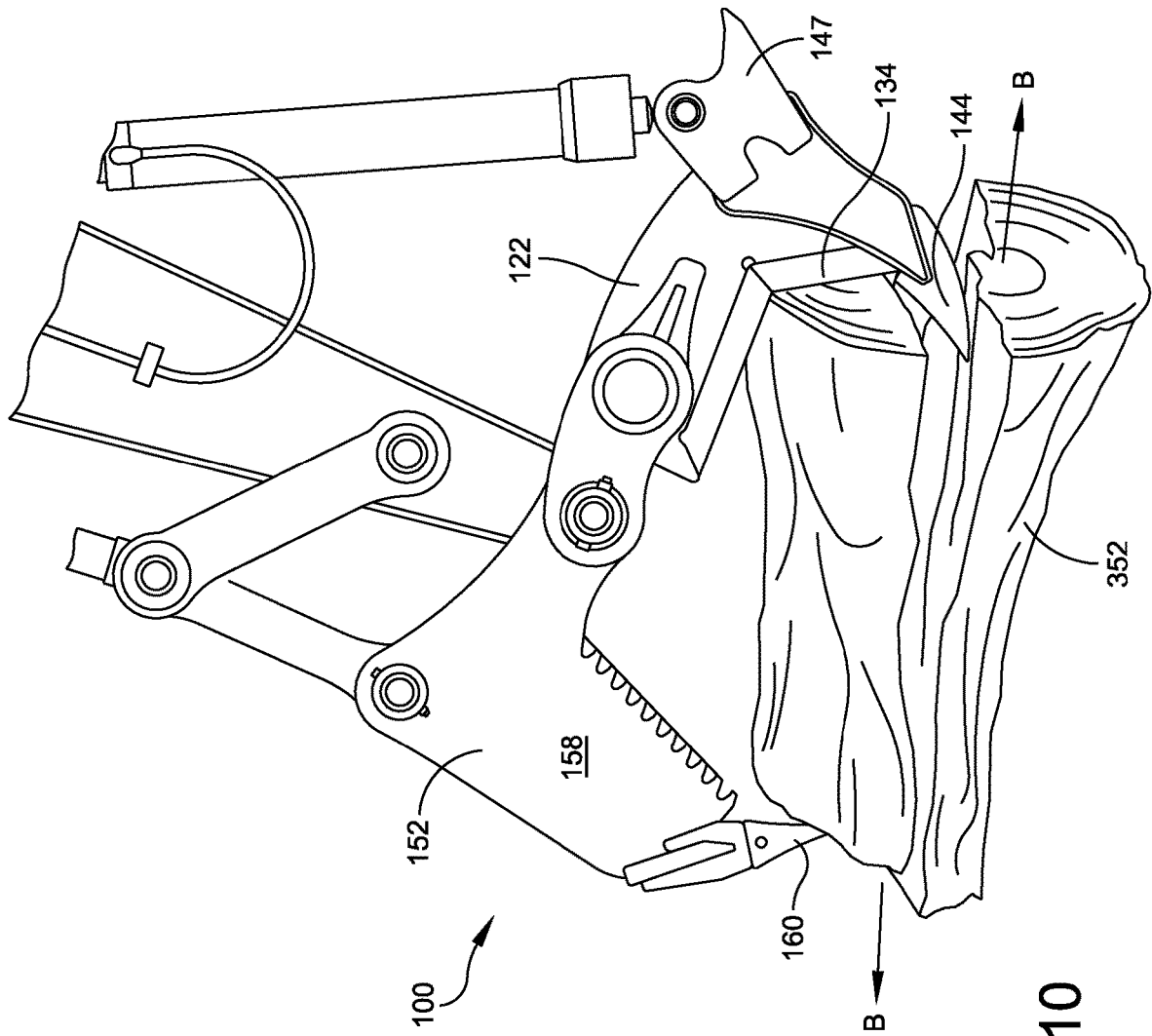
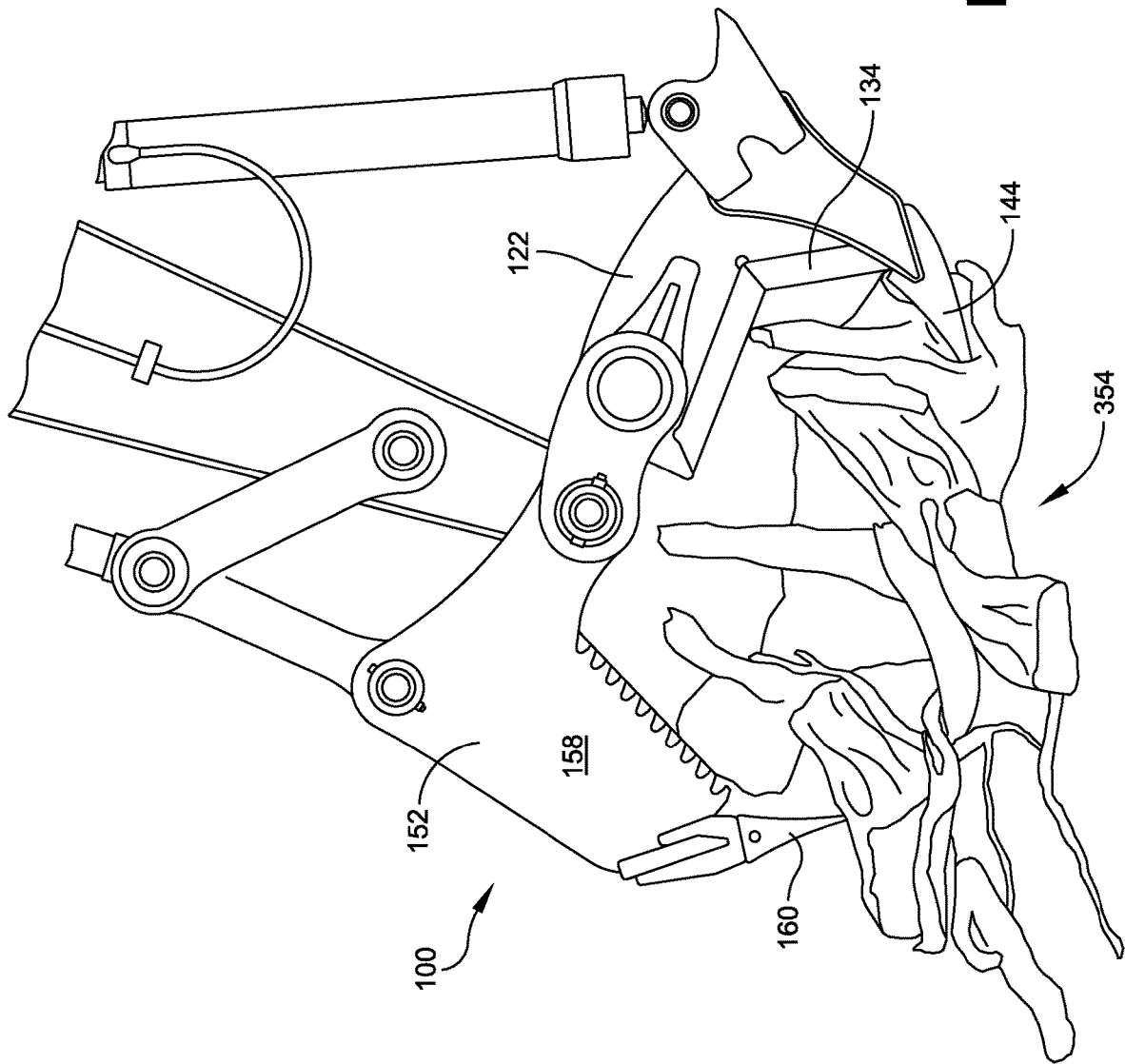


FIG. 10



**OPTIMIZED STUMP HARVESTER**REFERENCE TO PENDING PRIOR PATENT  
APPLICATION

This application is a divisional of U.S. patent application Ser. No. 15/944,364, filed Apr. 3, 2018 by Alfred Scott Guimond, et al. for "OPTIMIZED STUMP HARVESTER", which claims the benefit under 35 U.S.C. 119 (e) of U.S. Provisional Patent Application No. 62/489,838, filed Apr. 25, 2017 by Alfred Scott Guimond, Alfred Scott Guimond II, and Mark Nye for "OPTIMIZED STUMP HARVESTER," which patent application is hereby incorporated herein by reference.

## BACKGROUND

A stump harvester is a tool that attaches to an end of an excavator arm in place of a conventional excavator bucket. A traditional harvester functions to accomplish one or more of excavating, ripping, and/or prying stumpage from the ground, removing extraneous dirt and rocks by shaking and/or dropping the stump to the ground, shearing or cross-cutting the stump, splitting a log lengthwise, and manipulating and/or loading stumpage, pieces of stumpage, and/or other tree length materials.

Existing stump harvesters feature geometries that present a number of disadvantages and inefficiencies in accomplishing each the functions discussed above, resulting in a decreased ability to excavate, shake, split, and/or manipulate tree stumps and associated materials and/or a limited ability to multitask to perform all of the desired functions with a single tool, requiring multiple tools and/or accessories to perform the requisite tasks oftentimes necessary in tree, stump, and/or field clearing in preparation for industrial, transportation, or agricultural development.

## SUMMARY

This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key aspects or essential aspects of the claimed subject matter. Moreover, this Summary is not intended for use as an aid in determining the scope of the claimed subject matter.

One embodiment provides a stump harvester for attachment to a distal end of an excavator arm. The stump harvester may include a front jaw assembly pivotally coupled with a back jaw assembly, the front and the back jaw assemblies configured to move between an open position in which the front and the back jaw assemblies are hinged apart and a closed position in which the front and the back jaw assemblies are hinged together, wherein: (1) the back jaw assembly comprises: (a) a knife arm having a front side facing the front jaw assembly, a back side facing opposite the front jaw assembly, a proximal end disposed adjacent to the excavator arm, and a distal end offset from the excavator arm; (b) a cutting blade disposed along the front side of the knife arm, the cutting blade terminating in a sharpened cutting edge; and (c) a back positive stop disposed adjacent the cutting blade at the distal end of the knife arm; (2) the front jaw assembly comprises: (a) a grubbing arm having a back side facing the back jaw assembly, a front side facing opposite the back jaw assembly, a proximal end disposed adjacent to the excavator arm, and a distal end offset from the excavator arm; (b) a dual anvil extending toward the

back jaw assembly, the dual anvil comprising a first anvil wall separated from a second anvil wall by an anvil channel; and (c) a front positive stop protruding from the front side of the grubbing arm; (3) a centerline plane bisects the cutting edge and the anvil channel; and (4) the front and the back positive stops meet at the closed position in which the cutting edge is sheathed within the anvil channel.

Another embodiment provides a multi-purpose tool for attachment to an excavator arm. The multi-purpose tool may include a front jaw assembly pivotally coupled with a back jaw assembly. The front jaw assembly may include a grubbing arm having a front plate that connects left and right side plates, wherein the front, the left, and the right side plates each have a solid geometry. The back jaw assembly may include (1) a knife arm having a back side facing opposite the front jaw assembly and a front side facing the front jaw assembly, the knife arm extending from a proximal end adjacent to the excavator arm to a distal end offset from the excavator arm; and (2) a jointed cutting blade extending outward from the front side of the knife arm to a sharpened cutting edge having a dual-bevel cross-sectional geometry, wherein: (a) the jointed cutting blade comprises a proximal section abutting a distal section, the proximal section disposed at the proximal end of the knife arm and the distal section disposed at the distal end of the knife arm; and (b) the jointed cutting blade is disposed upon at least 70-90 percent of the front side of the knife arm between the proximal and the distal ends of the knife arm.

Yet another embodiment provides a method of operating a stump harvester having a front jaw assembly coupled with a back jaw assembly via a rotative coupling, wherein: (1) the front jaw assembly includes a grubbing arm, a front positive stop, a plurality of prying tines that extend outward from the grubbing arm toward the back jaw assembly, and a dual anvil having two opposing walls that extend outward from the grubbing arm toward the back jaw assembly, the two opposing walls separated by an anvil channel; (2) the back jaw assembly includes a knife arm, a back positive stop, a cutting blade having a cutting edge that extends outward from the knife arm toward the dual anvil, and a splitter fang that extends outward from a distal end of the knife arm toward the plurality of the prying tines; and (3) a centerline plane bisects the dual anvil channel, the plurality of the prying tines, the cutting edge, and the splitter fang. The method may include the steps of (a) attaching the stump harvester to a distal end of an excavator arm; (b) actuating the rotative coupling to rotate the front and the back jaw assemblies into an open position in which the knife arm and the grubber arm are separated; (c) actuating the excavator arm to dispose the front and the back jaw assemblies about a tree stump; (d) actuating the rotative coupling to rotate the front and the back jaw assemblies toward a closed position until the front and the back jaw assemblies tighten about the tree stump; (e) actuating the excavator arm and the rotative coupling to excavate the tree stump from a ground surface; and (f) actuating the excavator arm to agitate the tree stump contained within the front and the back jaw assemblies to remove one or more foreign particles from the excavated tree stump.

Other embodiments are also disclosed.

Additional objects, advantages and novel features of the technology will be set forth in part in the description which follows, and in part will become more apparent to those skilled in the art upon examination of the following, or may be learned from practice of the technology.

## BRIEF DESCRIPTION OF THE DRAWINGS

Non-limiting and non-exhaustive embodiments of the present invention, including the preferred embodiment, are

described with reference to the following figures, wherein like reference numerals refer to like parts throughout the various views unless otherwise specified. Illustrative embodiments of the invention are illustrated in the drawings, in which:

FIG. 1 illustrates a perspective view of one embodiment of an optimized stump harvester, as attached to an excavation arm of an excavator;

FIG. 2 illustrates a left perspective view of the stump harvester of FIG. 1;

FIG. 3 illustrates a right perspective view of the stump harvester of FIG. 1 in an open position;

FIG. 4 illustrates a right perspective, cut-away view of the stump harvester of FIG. 1 in a closed position;

FIG. 5 illustrates a cross-sectional view of a cutting blade sheathed within a dual anvil of the of stump harvester of FIG. 1, where the stump harvester is in the closed position of FIG. 4;

FIG. 6 provides a flowchart depicting an exemplary method of operating the stump harvester of FIG. 1;

FIGS. 7A-7B illustrate perspective views of the stump harvester of FIG. 1, having front and back jaw assemblies in the open position about a tree stump for excavation;

FIG. 8 illustrates a perspective view the stump harvester of FIG. 1 positioned to compact the ground at a stump excavation site;

FIG. 9 illustrates a perspective view of the stump harvester of FIG. 1 positioned to radially cross-cut a tree length;

FIG. 10 illustrates a perspective view of the stump harvester of FIG. 1 positioned to axially split a tree length lengthwise; and

FIG. 11 illustrates a perspective view of the stump harvester of FIG. 1 positioned to gather, load, and/or stockpile stumpage, tree lengths, and other organic materials.

#### DETAILED DESCRIPTION

Embodiments are described more fully below in sufficient detail to enable those skilled in the art to practice the system and method. However, embodiments may be implemented in many different forms and should not be construed as being limited to the embodiments set forth herein. The following detailed description is, therefore, not to be taken in a limiting sense.

Various embodiments of the systems and methods described herein relate to the effective removal/excavation of tree stumps, as well as the processing of tree stumpage, tree lengths, and/or other organic materials, including the removal of extraneous material(s) and debris from the stumpage, side-sweep grading and compacting the excavation site, cross-cutting/shearing the tree stump or tree length, axial log splitting lengthwise on the ground, and manipulating and loading or stockpiling stumpage, pieces of stumpage, and/or other tree length materials.

As discussed above in the Background section, existing stump harvester tools fail to provide effective geometries for accomplishing numerous stumpage, log, and/or tree material processing purposes with a single tool. For example, many existing stump harvester tools include cutting blades that are discrete in length and/or blunt edged. As a result, the harvester tool must be perfectly aligned with the material to be cut in order for the tool's blade to be effective. This can render the harvester ineffective or cause the harvester to require repetitive operator realignment before the discrete blade is properly positioned about the stump, log, or the tree length to be cut.

Many existing stump harvesters also lack a mechanism for lengthwise, axial log splitting, or if they include such a mechanism, the mechanism is inappropriately located and/or not designed for maximum efficacy. Other existing harvesters require replacement of the entire harvester once cutting blades and other components wear out, failing to provide options for component replacement and increased tool longevity.

Embodiments of an optimized stump harvester disclosed herein are geometrically designed to increase harvester productivity in a manner that enables the stump harvester to be properly aligned for consistent prying, excavating, cross-cutting, spitting, shaking, and/or otherwise manipulating and loading stump and/or other tree materials with minimized operator error and maximized control, all using a single multi-purpose tool. Various components of the optimized stump harvester may be formed from 150,000 PSI quenched and tempered alloy steels with hardened alloy pins and bushings throughout, providing reliable, high-strength performance.

FIG. 1 illustrates a perspective view of one embodiment of an optimized stump harvester 100, as attached to a distal end of an excavator arm 250 of a heavy-equipment excavator 200. Embodiments of the stump harvester 100 may be configured in quick coupler or pin-grabber compatible attachment versions, depending on preference. In one embodiment, the stump harvester 100 includes a pin group 102 that enables a pin-grabber style coupling between the harvester 100 and the excavator arm 250, such that the operator may make tool changes (e.g., between the stump harvester 100 and a bucket, etc.) in minutes as opposed to hours, enabling a quick-change exchange between the harvester 100 and either a bucket or another type of tool mounting to the end of the excavator arm 250. The pin group 102 may be formed of first and second heat treated alloy pins 104, 106 within super hard alloy bushings to ensure long-term quick-change versatility.

FIGS. 2-3 illustrate left and right perspective views of the stump harvester 100, respectively. In this embodiment, the stump harvester 100 may include a front jaw assembly 110 that is pivotally coupled with a back jaw assembly 120 via the second pin 106, as well as a steel torque tube 108 designed and sized to eliminate jaw twist in the back jaw assembly 120 when subjected to high forces.

The pivotal or rotational coupling of the front and the back jaw assemblies 110, 120 may be configured to facilitate movement of the jaw assemblies between an open position, shown in FIGS. 2-3, in which the front and the back jaw assemblies 110, 120 are hinged apart (e.g., in a position to be disposed about a stump or other tree materials) and a closed position 140, shown in FIG. 4, in which the front and the back jaw assemblies 110, 120 are fully hinged together (e.g., in which the stump or other tree materials have been severed). Operating the harvester 110 to move the jaw assemblies 110, 120 between the open and the closed positions 130, 140 is detailed further below.

The front jaw and the back jaw assemblies 110, 120 may be maneuvered by actuating the rotative coupling between the two jaws in any appropriate manner that rotates the jaw assemblies from the open position 130, to the closed position 140, and to any position therebetween. Generally, the front jaw assembly 110 may be actuated via a hydraulic arm 252 incorporated into a distal end of the excavator arm 250 of the excavator 200 (FIG. 2). In one embodiment, the back jaw assembly 120 may be passive and maintained in a stiff position by a rigid brace or solid steel strut (not shown) attached between the back jaw assembly 120 and the exca-

vation arm 250. The brace may be secured in a three-position bracket to an underside of the excavation arm 250 to provide ultra-strong adjustment. Alternatively, and similar to the actuation of the front jaw assembly 110, the back jaw assembly 120 may be powered hydraulically via a hydraulic cylinder 109 attached between the back jaw assembly 110 and the excavation arm 250. In one embodiment, the hydraulic cylinder 109 may utilize a heavy duty, five-thousand psi cylinder to maneuver the back jaw assembly 120 between the open and the closed positions 130, 140. The passive brace or the hydraulic cylinder 109 may be mounted to the back jaw assembly 120 using an oversized pin 107 located on a lower heel of the back jaw assembly 120.

Turning to the mechanics of the jaw assemblies, one embodiment of the back jaw assembly 120 may include a knife arm 122. The knife arm 122 may have a front or leading side 124, which faces the front jaw assembly 110 in the direction of arrow A, and a trailing or back side 126, which faces opposite the front jaw assembly 110, also opposite the direction of arrow A. The knife arm 122 may also include a proximal end 128 disposed adjacent the excavator arm 250 and a distal end 132 that is offset from the excavator arm 250 when the harvester 100 is attached to the excavator 200. The knife arm 122 may be formed of extra thick QT100 alloy steel that is hard faced on the front or leading side 124.

A cutting blade 134 may be disposed along the front side of the knife arm 122, such that the cutting blade 134 terminates in a sharpened cutting edge 136 that extends toward the front jaw assembly 110. The cutting blade 134 may cover a majority or an entirety of the front side 124 of the knife arm 122 between the proximal and the distal ends 128, 132 of the knife arm 122. In one embodiment, the cutting blade 134 extends over at least 70-90 percent of the front side 124 of the knife arm 122 between the proximal end 128 and the distal end 132. This extensive coverage enables to the harvester 100 to engage with stumpage and/or tree materials disposed between the front and the rear jaw assemblies 110, 120 regardless of any particular placement of the jaws 110, 120 about the material or the "aim" of the harvester 100. This configuration renders the harvester fiercely productive in that less precise positioning, and thus less operator control time and positioning repetition, are required for effective operation and engagement with the desired materials.

The cutting blade 134 may form any appropriate and/or desired planar shape. In one embodiment, the cutting blade may include two jointed blade portions. In this embodiment, the cutting blade 134 may include jointed proximal and distal sections 138, 142 that form an obtuse angle, D, therebetween, as shown in FIGS. 2-3. The angle, D, may be approximately 118 degrees. In other embodiments, the cutting blade 134 may form an arch, a parabolic shape, or any other appropriate profile or shape using any appropriate number of blade portions.

The cutting edge 136 of the blade 134 may be formed of AR500 steel. As shown in the cross-sectional view of FIG. 5, the cutting blade 134/cutting edge 136 may feature a sharpened, tapered, dual-bevel cross-sectional geometry that is, in one embodiment, manufactured using a three-dimensional CNC profile. The cutting edge 136 and the cutting blade 134 may be bisected by a centerline plane, C, that serves as a symmetrical center plane for the stump harvester assembly 100, as discussed in greater detail below with respect to the alignment of other assembly components.

In this embodiment, the back jaw assembly 120 may also include a splitter fang 144 that is disposed at the distal end

132 of the knife arm 122, directly below, in line with, and planer to the cutting blade 134. The splitter fang 144 may extend toward the front jaw assembly 110 and culminate in a piercing tip 146 that is bisected by the centerline plane, C, that also bisects the cutting edge 136 of the cutting blade 134, shown in FIG. 5. This planar alignment between the cutting blade 134/cutting edge 136 and the splitter fang 144 further enables productivity of the back jaw assembly 120 of the stump harvester 100, in that it provides an optimal geometry for efficient tree and stump splitting both radially across and axially with the wood grain. In one embodiment, the splitter fang 144 may be oriented at an obtuse angle of approximately 122 degrees relative to the distal section 142 of the cutting blade 134.

Both the cutting blade 134 and the splitter fang 144 may be removably attached to the back jaw assembly 120 in any appropriate manner. Thus, the components may be removed for sharpening, repair, and/or replacement as needed. The replaceable nature of the cutting blade 134 and the splitter fang 144 increases the longevity of the stump harvester 100. Rather than replacing or refurbishing the entirety of the harvester 100 when components dull or are otherwise compromised, these individual parts may be removed and either serviced and reattached or replaced entirely.

The back jaw assembly 120 may further include rhinotype horn 147 mounted to the back side 126 of the knife arm 122 for the purpose of ripping, flipping, dragging, and/or back-dragging ground, stump, and tree debris. The rhino horn 147 may also be used for side-sweeping the worksite floor.

To facilitate efficient operation that does not prematurely wear the cutting blade 136, the knife arm 122 may also incorporate a back positive stop 148 positioned at the distal end 132 of the front side 124 of the knife arm 122 between the cutting blade 134 and the splitter fang 144. The back positive stop 148 may physically interact or collide with a corresponding front positive stop 150 positioned on the front jaw assembly 110 to ensure proper movement of the jaw assemblies 110, 120 between the open and the closed positions 130, 140, as detailed further below.

Turning to the front jaw assembly 110, which opposes and is pivotally coupled with the back jaw assembly 120, one embodiment may include a grubbing arm 152 having a back side 154 facing the back jaw assembly 120, a front side 156 facing the front of the harvester 100 opposite the back jaw assembly 120, two solid side plates 158, and a front plate 159. In this embodiment, the side plates 158 and the front plate 159 may each feature a solid geometry configured to push, move, and/or sweep earth and/or other debris when the harvester 100 is swept along the ground, facilitating worksite cleanup and side-sweep grading and compaction around and within the extraction hole created by the removal of a stump. The side and front plates 158, 159 may be formed of extra thick (based on carrier weight class) QT100 alloy steel. Further, each of the side plates 158 may feature a serrated edge 161 that assists in locking, gripping, and controlling the stump or log during the splitting, shearing, and/or the cross-cutting processes.

In one embodiment, at least four replaceable prying tines 160, also called digging points or teeth, ground-engaging points, or prying points, may extend rearward from the back side 154 of the grubbing arm 152 toward the splitter fang 144 on the knife arm 122. The prying points may be oriented at an obtuse angle of approximately 118 degrees relative to the back side 154 of the grubbing arm 152. In this embodiment, the prying tines 160 may be symmetric about the centerline plane, C, discussed above, which bisects the

harvester **100** down a center of the cutting edge **136** and the splitter fang **144**. The prying tines **160** may function to rip, pry, and dig during the excavation process. They also work in conjunction with the splitter fang **144** in radially splitting tree lengths or logs lengthwise.

The front jaw assembly **110** may also include a dual anvil **162** that extends rearward from the grubbing arm **152** toward the back jaw assembly **120**. In this embodiment, the dual anvil **162** may include two anvil walls **164** separated by an anvil channel **166**. The anvil walls **164** and the anvil channel **166** may be symmetrically positioned about the centerline plane, C, such that the anvil channel **166** is bisected by the centerline plane, C, in planar alignment with the cutting edge **136** of the cutting blade **134**.

FIG. **5** illustrates a cross-sectional view of the cutting blade **134** received within the dual anvil **162** when the jaw assemblies **110**, **120** are pivoted into the closed position **140**. To protect the blade edge **136** during the shearing movement, one embodiment of the opposing anvil walls **164** may form the anvil channel **166** with a v-shaped profile that mirrors a profile of the dual-bevel cutting blade **134**. When the front and the back jaw assemblies **110**, **120** are pivoted into the closed position **140** such that the back positive stop **148** located on the knife arm **122** collides or meets with the front positive stop **150** located on the grubbing arm **152**, as shown in FIG. **4**, the anvil channel **166** receives, sheaths, or envelops the cutting edge **136** of the cutting blade **134**, as shown in FIG. **5**.

The anvil channel **166** may be identical in width, slightly narrower, or slightly wider (FIG. **5**) than the cutting blade **134**, and the anvil walls **164** may take any appropriate shape, so long as the dual anvil **162** sheaths the blade **134** in a manner that protects the cutting edge **136** from distorting, blunting, or “mushrooming” against any other component surface when the jaw assemblies **110**, **120** move into the closed position **140**. That is, by leveraging the anvil channel **166**, the dual anvil **162** sleeves the cutting blade **134** when the front and the back jaw assemblies **110**, **120** are closed about a stump or other tree materials. As a result, the cutting blade **134** and its edge **136** bypass interference with other harvester components that are damaging to the blade edge **136** and come to rest at an end of the shearing movement without ever coming into flush contact with any surface other than the stumpage, tree lengths, and/or other organic material held within the jaws assemblies **110**, **120** for processing. In this regard, the dual anvil **162** acts as an anvil to the wood or other organic materials contained within the jaw assemblies **110**, **120**, but not to the cutting blade **134** itself, which prevents wear and tear (e.g., mushrooming of the blade edge **136**) to the cutting blade **134** and preserves the sharpness of the cutting edge **136**. The dual anvil **162** may be formed of virtually unbreakable QT100 hardened alloy steel.

In operation, the back jaw assembly **120** and knife arm **122** act as a thumb or a clamp when the opposing front jaw assembly **110** and grubbing arm **152** are activated to close the harvester **100**, or to move the front and the back jaw assemblies **110**, **120** between the open and closed positions **130**, **140**. The following unique geometries of the harvester **100** allow the excavator operator to efficiently multitask using a single attached tool: (1) the front jaw assembly **110** using the four prying tines **160**, the planar dual anvil **162**, and the solid, serrated side plates **158**; and (2) the back jaw assembly **120** featuring both the planar and replaceable splitter fang **140** and the planar and sharpened, dual-bevel, replaceable cutting blade **134** that extends over the majority

of the front side **124** of the knife arm **122** and that extends into the opposing dual anvil offset **166** in the closed position **140**.

FIG. **6** provides a flowchart depicting an exemplary method (**300**) of operating the harvester **100** to leverage the unique features discussed above to perform multiple different processing operations upon stumpage, logs, tree lengths, and/or other organic materials, while FIGS. **7-11** illustrate perspective views of specific steps of the method (**300**).

In one embodiment, the method (**300**) may begin with attaching the harvester **100** to the excavator arm **250** of an excavator such as excavator **200** (**302**). This attachment (**302**) may occur in any appropriate manner, including via a quick coupler or a pin-grabber style coupling that allows the harvester **100** to be attached and enabled in a matter of seconds to minutes. Once attached, the excavator operator may employ the excavator controls to maneuver the harvester **100** (**304**), including rotating the front and the back jaw assemblies **110**, **120** through a range of positions between the open position **130** and the closed position **140**. As shown in FIGS. **7A-7B**, the splitter fang **144**, the prying tines **160**, and the serrated edges of the side plates **161** of front and the rear jaw assemblies **110**, **120** may then be used to pry or excavate a stump **350** from the ground (**306**) with both high speed and minimal effort. Once excavated (**306**), the excavator **200** may maneuver the harvester **100** to agitate (e.g., shake, drop, pick-up) the excavated stump to remove extraneous materials such as dirt, rocks, and/or other foreign objects from the load (**308**). In addition, and as shown in FIG. **8**, the solid side and front plates **158**, **159** of the harvester **100** may be side-swept along or tamped upon the ground to grade the excavation site and compact the excavation hole created by the removal of the stump **350** (**312**).

The harvester **100** may also be employed to cross-cut/shear/radially split the excavated stump **350** or any stump, log, or tree length **352** in a direction perpendicular to the wood grain represented by axis B (**314**), as shown in FIG. **9**. Additionally or alternatively, the harvester **100** may be used to axially split the stump **350** or tree length **352** lengthwise along the wood grain represented by axis B (**316**), as shown in FIG. **10**. The rhino-type horn **147** of the harvester **100** may be employed to rip, flip, drag, and/or back-drag ground, stump, and tree debris, as appropriate for clean-up or material processing (**318**). Because the back jaw assembly **120** acts as a clamp to retain extracted, cut, and/or split stumpage or tree material within the closed jaws of the harvester **100**, the operator may also use the harvester **100** to gather and load a variety of organic material **354** into trucks or grinders or stockpile product for later handling (**320**), as shown in FIG. **11**.

In performing the processing operations of the method (**300**), discussed above, the dual anvil **162** protects the cutting edge **136** of the blade **134** during the cutting and/or shearing process, in that the blade edge **136** is sheathed within the anvil channel **166** between the anvil walls **164** when the jaw assemblies **110**, **120** are moved into the fully closed position **140** in which the back positive stop **148** on the knife arm **122** meets the front positive stop **150** on the grubbing arm **152**, as discussed above in relation to FIGS. **4-5**.

Further, the four distinct prying tines **160** opposing the splitting fang **144** allow for dispersed load bearing and management of irregular shapes, including stump anomalies, root systems, and rocks. The four prying tines **160** also serve to support a stump, log, or tree portion for radial cross-cutting and axial splitting lengthwise via the splitting fang **144**, while the serrated edges **161** of the side plates **158**

lock the stump, log, or tree portion into position for excavating, cutting, shearing, splitting and/or manipulating/loading.

The planar alignment and replaceable nature of the splitter fang 144, the opposing prying tines 160, and the sharpened, dual-bevel cutting blade 134 spanning the majority of the front side 124 of the knife arm 122 render the stump harvester the fastest, most productive, and efficient tool for harvesting and excavating stumpage, cleaning rock, dirt, and other debris from the stump, shearing and cross-cutting the stump, axially splitting stumpage or other tree portions, and also positioning the stump, tree portion, or other material for stockpiling and/or loading into trucks or grinders. The harvester 100 also serves as a ground cleanup tool. In this regard, rather than requiring a number of different tools to carry out the operations necessary in clearing stumpage in anticipation of road or other industrial development, the optimized harvester 100 may be employed to carry out all of the requisite operations. Using one tool rather than many for excavation, cross-cutting, splitting, ground cleanup and compaction, and loading and/or stockpiling saves abundant resources otherwise required for additional manpower and tooling accessories, as well as time required for multiple tooling changes.

In one embodiment, the components of the stump harvester 100 are custom fabricated, with the exception of the prying tines 160 on the front jaw assembly 110 and the replaceable splitter fang 144 on the back jaw assembly 120. Many components may be profiled to reduce weight.

Although the above embodiments have been described in language that is specific to certain structures, elements, compositions, and methodological steps, it is to be understood that the technology defined in the appended claims is not necessarily limited to the specific structures, elements, compositions and/or steps described. Rather, the specific aspects and steps are described as forms of implementing the claimed technology. Since many embodiments of the technology can be practiced without departing from the spirit and scope of the invention, the invention resides in the claims hereinafter appended.

What is claimed is:

1. A multi-purpose tool for attachment to an excavator arm, the tool comprising a front jaw assembly pivotally coupled with a back jaw assembly, wherein:

the front jaw assembly comprises:

a grubbing arm having a front plate that connects left and right side plates, wherein the front, the left, and the right side plates each have a solid geometry; and the back jaw assembly comprises:

a knife arm having a back side facing opposite the front jaw assembly and a front side facing the front jaw assembly, the knife arm extending from a proximal

end adjacent to the excavator arm to a distal end offset from the excavator arm; and

a jointed cutting blade extending outward from the front side of the knife arm to a sharpened cutting edge having a dual-bevel cross-sectional geometry, wherein:

the jointed cutting blade comprises a proximal section abutting a distal section, the proximal section disposed at the proximal end of the knife arm and the distal section disposed at the distal end of the knife arm; and

the jointed cutting blade is disposed upon at least 70-90 percent of the front side of the knife arm between the proximal and the distal ends of the knife arm:

further comprising:

a front positive stop disposed upon the grubbing arm; a back positive stop disposed upon the knife arm; and a dual anvil extending from the grubbing arm toward the knife arm, the dual anvil comprising opposing anvil walls separated by an anvil channel, the dual anvil having a planar face and a base portion in opposition to one another, the planar face of the dual anvil containing the anvil channel, and the base portion of the dual anvil supported along the grubbing arm over a length corresponding to the anvil channel, wherein:

the cutting edge of the jointed cutting blade defines a centerline plane; and

the centerline plane bisects the anvil channel, such that when the front and the back jaw assemblies are pivoted into a closed position in which the front and the back positive stops meet, the cutting edge is sheathed within the anvil channel.

2. The multi-purpose tool of claim 1, further comprising: a splitter fang disposed at the distal end of the knife arm, the splitter fang tapering to a piercing tip that extends toward the front jaw assembly; and

at least two prying tines disposed at the distal end of the grubbing arm and extending toward the back jaw assembly, wherein the centerline plane bisects the piercing tip, and wherein the at least two of the prying tines are symmetrically disposed about the centerline plane.

3. The multi-purpose tool of claim 2, wherein the splitter fang, the jointed cutting blade, and the at least two of the prying tines are removable.

4. The multi-purpose tool of claim 1, wherein the left and the right side plates each include a serrated edge bordering a back side of the grubbing arm and extending toward the back jaw assembly.

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